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(54) Open-mouth containers and method and mould core for making them.

(57) An open-mouth container (1) having a mouth (8) which partially undercuts the body of the container yet which can be shaped about a simple core (12).

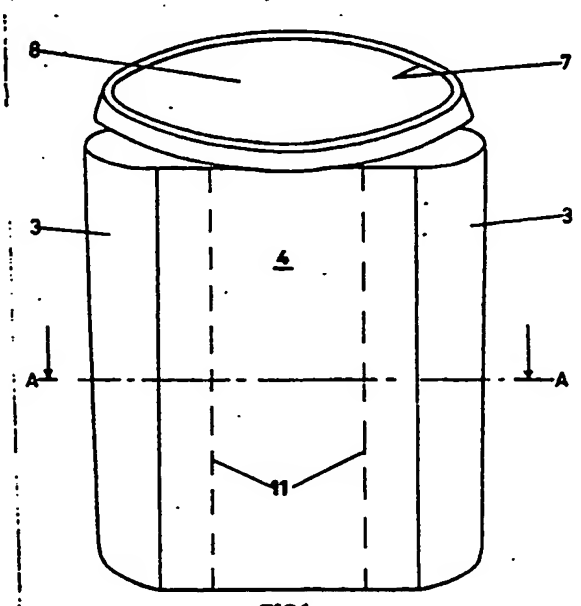

FIG1

EP 0 000 823 A1

Croydon Printing Company Ltd.

OPEN-MOUTH CONTAINERS AND METHOD AND MOULD CORE FOR MAKING THEM

This invention relates to an open-mouth container (such as a paint can) suitable for lidding and adapted to be easily shaped using moulds comprising core and preferably also cavity components.

When an open-mouth container is to be lidded, it is often designed so that the perimeter of the lid when applied to the mouth will not overhang the body of the container. Overhanging lids space apart the containers wasting storage space and when containers with such lids form a line of lidded containers which issues from a lidding machine, it is found that the line lacks stability if the bodies of adjacent containers are not contiguous. Overhanging lids can be avoided by providing the containers with a mouth whose perimeter is defined by an inwards extension of the body so that the inner surface of the body lies outside the perimeter of the mouth. However, this means that the perimeter of the mouth undercuts the body. Therefore, if the container is to be shaped using a mould having a core component, then the undercutting perimeter can only be obtained using complex techniques involving five or more movements of segments of the core and such techniques are generally prone to excessive wear and also cannot be cooled quickly enough to be used economically in the mass production processes used in shaping articles such as disposable containers.

The object of this invention is to provide a container which can be placed next to a similar container with the bodies of the containers contiguous even when they are lidded and which can be shaped around the core component of a mould (especially the core component of a core-and-cavity mould) using a relatively simple technique.

Accordingly the invention provides an open-mouth container comprising:

a) a body composed of at least two longitudinal protruding portions and at least two longitudinal inset portions, the portions having inner surfaces which define the inner surface of the body, and

b) extensions of the protruding and inset portions of the body which extensions define the perimeter of the mouth of the container,

characterised in that the inner surface of each protruding portion lies outside the perimeter of the mouth and the inner surface of each inset portion lies not outside the perimeter of the mouth so that the mouth-defining extension of each protruding portion extends inwardly of the inner surface of the body and the mouth-defining extension of each inset portion does not extend inwardly of the inner surface of the body and wherein the dimensions of the inner surfaces of the protruding and inset portions are such that if the inset portions were notionally removed from the body and the protruding portions were notionally moved inwards until they touched along their longitudinal boundaries, then the notional inner surface defined by the inner surfaces of the touching protruding portions must be capable of being passed through the mouth of the container. Preferably, the notional inner surface defined by the notional touching protruding portions should be smaller than the perimeter of the mouth, although some latitude in this respect can be tolerated if the perimeter of the mouth is resiliently deformable. "Longitudinal" means lengthwise of the container and the length of the container is the length of its principal axis, namely the axis which passes through both its base and its mouth. "Transverse" means in a plane perpendicular to the principal axis.

The invention also provides a process for making the containers which comprises:

a) shaping material around the core component of a mould which defines inner surface of the container wherein the core comprises at least two first segments which define the inner surfaces of the protruding portions of the body and which are separated from one another by at least one second segment which defines at least part of the inner surfaces of the inset portions of the body,

b) withdrawing the second segment or segments through the mouth of the newly shaped container,

c) moving the first segments into space vacated by the second segment or segments,

d) withdrawing the first segments through the mouth, and

e) if necessary employing means (preferably a cavity component of the mould) to shape the outside surface of the container.

The invention further provides a core component for the mould, the core component comprising at least two (preferably two or three) first segments separated from one another by at least one (and preferably only one) second segment, and also a mould comprising a combination of such a core and a cavity component which defines the outer surface of the container. Preferably, the segments of the core are tapered to facilitate withdrawal of the second segment or segments.

A container according to this invention even when suitably lidded can still be placed next to a similar lidded container so that the bodies of the containers are contiguous. This is possible because the protruding portions of the body lie outside the perimeter of the mouth so that a lid of suitable dimensions applied to the mouth will not overhang at least part of the protruding portions.

The containers can be shaped around a core component of a mould using a relatively simple core which can be withdrawn through the mouth of the newly shaped container by an operation which needs only three movements of segments of the core although extra movements can be added if desired. This is possible because the internal surface of each inset portions of the body part of the container is not undercut by the perimeter of the mouth. Therefore, the (or each) second segment of the core (which defines at least part of these internal surfaces) can be directly withdrawn through the mouth and the first segments moved into space vacated by the second segment or segments whereafter the first segments too can be withdrawn through the mouth.

The protruding and inset portions of the body may be curved or flat. Preferably, the protruding and inset portions are of approximately uniform thickness so that the inner surface of a portion is of substantially the same shape as the outer surface of the portion.

Typical containers having protruding and inset portions of uniform thickness may comprise portions all of which are curved, the protruding portions being of greater curvature than the inset portions so producing a lobate container in which the protruding portions constitute the lobes. Preferably, a bi-lobate container in transverse section has the shape of an oblate circle, that is to say a circle modified by the replacement of two diametrically opposed arcs by opposed curves whose maximum diameter is less than the diameter of the circle. These curves therefore constitute inset portions while the remaining arcs of the circle constitute lobes. Preferably, the maximum diameter of the inset portions is at least 90% (preferably at least 95%) of the diameter of the circle and the inset portions preferably subtend an angle of from 20° to 80° to the principal axis of the container so

as to produce a container which appears to be cylindrical. Alternatively, the containers may be elliptical in transverse section. Optionally, the curvature of the inset portions may be decreased until the inset portions are flat or even concave. Tetra-lobate and especially bi-lobate containers are the easiest shapes for use in lidding machines.

If desired the inset portions may take the form of narrow longitudinal re-entrant flutes, each flute preferably providing less than 10% of the internal transverse perimeter of the container. It is also preferred that the flutes be curved in transverse section since this facilitates the shaping process.

If the protruding portions of the body were parallel to the principal axis of the container, such an arrangement would provide a maximum line of contiguity between contiguous containers. However, the core component of the mould is more easily withdrawn from the container if the protruding and inset portions are inclined so that the container tapers towards its base. Preferably, the portions are inclined at an angle of from 0.1^{o} to 3^{o} (especially 0.2^{o} to 0.6^{o}) to the principal axis. Provided small inclinations are employed the taper does not seriously interfere with the ability of containers to pack together efficiently or to be stable in processing lines possibly because the resilience of the container accommodates the taper sufficiently to allow a useful length of contiguity between contiguous containers.

It is preferred that the transverse sectional area of the mouth be at least 85% of the maximum transverse sectional area of the body. Lids suitable for application to the mouths of the containers preferably have dependent skirts which engage about the perimeter of the mouth. Engagement may be simply by a push fit but preferably the

skirt and perimeter are adapted to provide a positive engagement, for example, by providing them with mating screw threads or profiles which engage with a snap action.

The containers may be shaped from any materials which can be made to comply with the shape of the core component of the mould. For example, sheets of ductile metal may be swaged around the core or sheets of heat-softened thermoplastics may be vacuum-formed around the core. Preferably, the containers are made by injecting fluid material into the core-and-cavity mould. The fluid material may be a curable synthetic resin but preferred fluid materials are molten thermoplastic polymers, especially thermoplastic polyolefins including polystyrene. Suitable aliphatic polyolefins include polyethylenes of low or high density, crystallines copolymers of ethylene with up to 20% by weight of methyl, ethyl or butyl acrylate or methacrylate or vinyl acetate, or crystalline polymers of propylene. Although propylene homopolymer may be used, adjacent containers are better able to accommodate tapered body parts if the polymer is one in which propylene is copolymerised with ethylene either as a random copolymer of propylene and a minor amount of ethylene or as a sequential copolymer of propylene with up to 15% by weight of ethylene made by injecting the ethylene into the latter stages of what would otherwise have been a homopolymerisation of propylene. Alternatively, propylene homopolymer may be blended with up to 20% by weight of a rubber, for example, diene modified ethylene/propylene rubber. The melt flow index of the polyolefin is preferably from 1.5 to 30 grams per 10 minutes when measured according to British Standard 2782:Part 1/105C/1970 using a 2.16 kg load and performed at 190°C in the case of the ethylene polymers and at 230°C in the case of the propylene polymers.

The invention is further illustrated by the following preferred embodiments describes with reference to the drawings of which:

Figure 1 shows in perspective a bi-lobate container having flat inset portions.

Figure 2 shows in section a skirted lid suitable for use on the container shown in Figure 1.

Figure 3 shows on a smaller scale a transverse section of the body of the container on the line AA of Figure 1.

Figure 4 shows a longitudinal section of the container on the line BB of Figure 3.

Figure 5 shows a longitudinal section of the container on the line CC of Figure 3.

Figure 6 shows diagrammatically a notional arrangement in which the inset portions of Figure 3 are removed and the protruding portions or lobes are moved notionally together.

Figure 7 shows on a larger scale a core suitable for use in shaping the container shown in Figure 1.

Figure 8 shows on a smaller scale in section the core of Figure 7 in position in a core-and-cavity mould.

Figure 9 shows in section the mould of Figure 8 with the second segment of the core withdrawn and the first segments closed together.

Figure 10 shows a section on the line DD of Figure 8 after the cores have been moved together as shown in Figure 9.

Figures 11 and 12 show a modification of the mould shown in Figures 8, 9 and 10.

Figure 13 shows in detail on a larger scale and in section part of a modified container and lid on which a second container is stacked.

Figure 14 shows in section a further modification of the container of Figure 1.

Figure 15 shows in perspective a lidded tri-lobate container.

Figure 16 shows in section a core for shaping the tri-lobate container of Figure 15.

Figure 17 shows in perspective a lidded fluted container.

Figure 18 shows a section on the line EE of Figure 17.

Figure 19 shows in perspective a lidded rectangular container.

Figure 20 shows in section a core for shaping the container of Figure 19.

Figure 1 shows an open-mouth container 1 having a body composed of two longitudinal protruding portions or lobes 3 and two flat inset portions 4. Lobes 3 and flat inset portions 4 have extensions 5 and 6 respectively which are shown in Figures 4 and 5. Extensions 5 and 6 together define perimeter 7 of the open mouth 8. The extensions 5 of lobes 3 extend inwardly of the body so that inner surfaces 9 of lobes 3 lie outside (and are therefore undercut by) perimeter 7 of open mouth 8 as is shown in Figure 3. This enables a suitably sized circular lid 2 as shown in Figure 2 to be applied to perimeter 7 without overhanging lobes 3.

In contrast extensions 6 are straight extensions of flat inset portions 4 not extending inwards of the body. Accordingly, as is shown in Figure 3, inner surfaces 10 of inset portions 4 lie within perimeter 7 of open mouth 8. This means that if inset portions 4 are notionally removed from container 1 as shown in Figure 6 and lobes 3 are notionally moved inwards until their longitudinal boundaries 11 (see Figure 1) touch, then their inner surfaces 9 would define a notional surface as shown in Figure 6 which could notionally be passed through open mouth 8. The importance of this is that it enables

container 1 to be shaped around a core 12 as shown in Figure 7 despite the undercutting of lobes 3 by perimeter 7 for reasons which will now be explained.

Core 12 has first segments 13 separated by tapered second segment 14. During moulding in a mould comprising core 12 and cavity 15 as shown in Figures 8, 9 and 10 the internal surfaces 9 of lobes 3 and part 10a of the internal surface 10 of flat inset portion 4 are defined respectively by outer longitudinal surfaces 13a and 13b of first segments 13. At the same time, the remainder 10b of the internal surface 10 of flat inset portion 4 is defined by outer longitudinal surface 14a of second segment 14. Because extension 5 does not extend inwards of flat inset portion 4, perimeter 7 of open mouth 8 does not undercut flat inset portion 4 and therefore second segment 14 of core 12 can be withdrawn from newly moulded container 1 through its open mouth 8 whereupon it vacates space 16 shown bounded by dashed lines in Figure 9. First components 13 are moved into space 16 (as shown bounded by dashed lines in Figure 10) and then they too can be withdrawn through perimeter 7 of open mouth 8. Hence, despite the undercutting of lobes 3 by perimeter 7, core 12 can be withdrawn from container 1 with a minimum of three movements of segments 13 and 14 relative to container 1.

The mould shown in Figures 8, 9 and 10 is provided with bars 17 which guide second segment 14 during its withdrawal. Push rods 18 are provided which are used to move first segments 13 into space 16 vacated by second segment 14 whereafter cavity 15 and container 1 can be lifted clear of first segments 13 during which movement first segments 13 are passed through open mouth 8. Retractable bars 19 are provided to retract components 20 of cavity 15 so that container 1 can be kocked out of cavity 15 by a blow on sprue 21.

The lobes 3 and inset portions 4 of container 1 are tapered at an angle of 0.25° to the principal axis of container 1 to facilitate withdrawal of second segment 14 and the knocking of container 1 out of cavity 15. The taper is exaggerated for clarity in Figures 1, 4, 5, 8, 10, 11 and 12.

Figures 11 and 12 show a modification to the mould shown in Figures 8, 9 and 10. The modification consists of providing inclined guide bars 17a so that withdrawal of second segment 14 causes a closing together of guide bars 17a which in turn causes a simultaneous movement of first segments 13 into space 16. The modification has the advantage of obviating the use of push rods 18.

Figure 13 shows circular lid 2 fitted into perimeter 7 of open mouth 8. Lid 2 has a dependent skirt 22 provided with a lip 23 which makes a snap-action fit over a co-operating barbed profile 24 of extensions 5 and 6. Lid 2 is modified by the provision of an upstanding circumferential flange 25 and base 26 of the container is modified by the provision of dependent studs 27. Flange 25 and studs 27 co-operate to locate stacked lidded containers one on top of another.

Figure 14 shows a modified container body 28 which is a modification of the body of container 1. Like the body of container 1, the modified container body 28 has lobes 31 which are arcs of a common circle. The modification consists of replacing flat inset portions 4 of the body of container 1 by curved inset portions 29. The maximum diameter of the modified container body 28 through mid-points 31 of inset portions 29 is 96% of the diameter of common circle on which lobes 31 lie. The inset portions 29 subtend an angle of 60° to the principal axis with the result that in transverse section container body 28 has the shape of an oblate circle. The curvature of inset portions 29 is merged into the curvature of lobes 31 and

this disguises the presence of inset portions 29 and gives the modified container body 28 a cylindrical appearance.

Figure 15 shows a lidded tri-lobate container 32 having three lobes 33 and three curved inset portions 34. Figure 16 shows a core 35 suitable for using in shaping container 32. Core 35 consists of three first segments 36 separated by a three-armed second segment 37.

Figures 17 and 18 show a lidded container 38 having four lobes 39 and inset portions which are longitudinal flutes 40. Ledges 41 are provided over flutes 40 so as to provide a fulcrum for use when levering snap-fitting lid 42 off container 38.

Figures 18 and 19 show a rectangular lidded container 43 having flat protruding portions 44 and fluted inset portions 45 surmounted by ledges 46 each of which provides a fulcrum for use when levering snap-fitting lid 50 off container 43. Figure 20 shows a core 47 suitable for use in shaping container 43. Core 47 consists of four first segments 48 separated by second segment 49.

CLAIMS

1. An open-mouth container comprising:

a) a body composed of at least two longitudinal protruding portions and at least two longitudinal inset portions, the portions having inner surfaces which define the inner surface of the body, and

b) extensions of the protruding and inset portions of the body which extensions define the perimeter of the mouth of the container,

characterised in that the inner surface of each protruding portion lies outside the perimeter of the mouth and the inner surface of each inset portion lies not outside the perimeter of the mouth so that the mouth-defining extension of each protruding portion extends inwardly of the inner surface of the body and the mouth-defining extension of each inset portion does not extend inwardly of the inner surface of the body and wherein the dimensions of the inner surfaces of the protruding and inset portions are such that if the inset portions were notionally removed from the body and the protruding portions were notionally moved inwards until they touched along their longitudinal boundaries, then the notional inner surface defined by the inner surfaces of the touching protruding portions must be capable of being passed through the mouth of the container.

2. A container according to claim 1 characterised in that the protruding and inset portions of the body are curved in transverse section, the protruding portions being of greater curvature than the inset portions.

3. A container according to claim 2 characterised in that the body of the container is bi-lobate.

4. A container according to claim 3 characterised in that the body of the container in transverse section has the shape of an oblate circle.

5. A container according to claim 4 characterised in that the maximum diameter of the inset portions of the body is at least 90% of the maximum diameter of the oblate circle.

6. A container according to claim 5 characterised in that the inset portions subtend an angle of from 20° to 80° to the principal axis of the container.

7. A container according to claim 1 characterised in that the inset portions of the body are re-entrant flutes.

8. A container according to claim 7 characterised in that each flute provides less than 10% of the internal transverse perimeter of the container.

9. A process for making a container according to claim 1 which comprises:

a) shaping material around the core component of a mould which defines inner surface of the container wherein the core comprises at least two first segments which define the inner surface of the protruding portions of the body and their undercutting extensions and which are separated from one another by at least one second segment which defines at least part of the inner surfaces of the inset portions of the body,

b) withdrawing the second segment or segments through the mouth of the newly shaped container,

c) moving the first segments into space vacated by the second segment or segments, and

d) withdrawing the first segments through the mouth.

10. A process according to claim 9 characterised in that while the material is shaped around the core component, it is constrained within a cavity component of the mould which shapes the material so as to define the outside surface of the container.

11. For use in the process of claim 9, a core component comprising at least two first segments separated from one another by a single second segment characterised in that the first segments define the inner surfaces of the protruding portions of the body and their undercutting extensions and the second segment defines at least part of the inner surfaces of the inset portions of the body.

12. A core component as claimed in claim 11 in combination with a cavity component which defines the outer surface of the container.

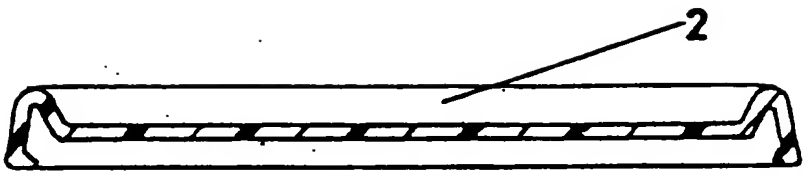

FIG 2

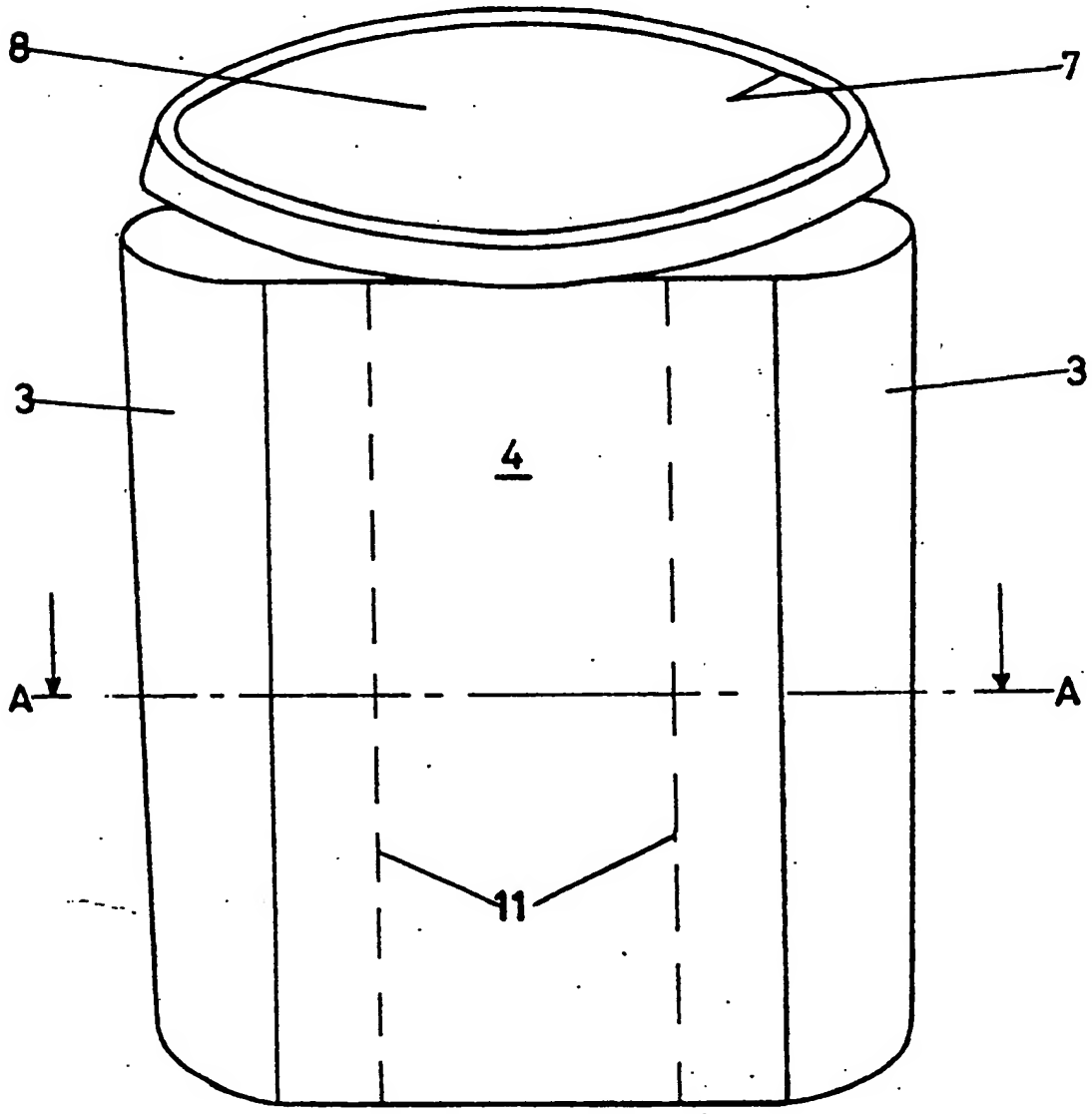

FIG1

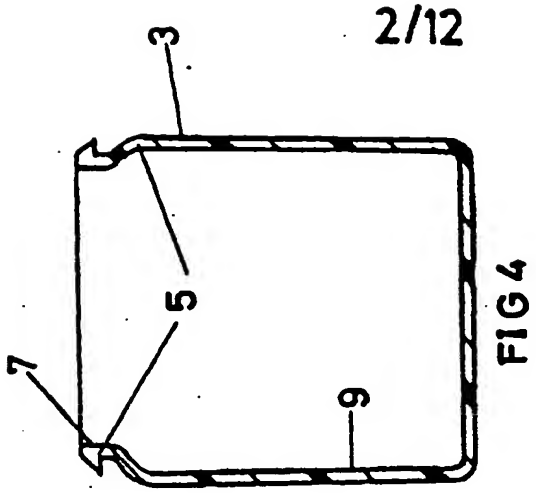

FIG 4

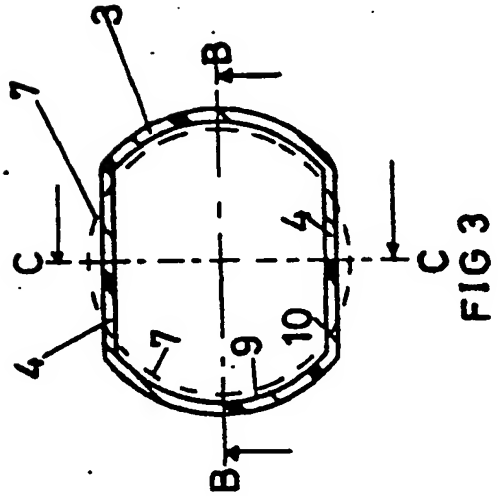

FIG 3

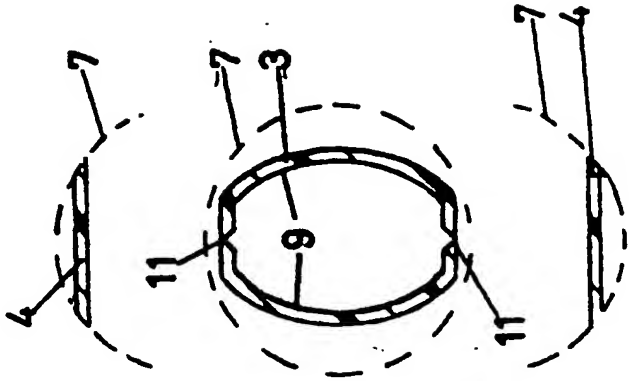

FIG 6

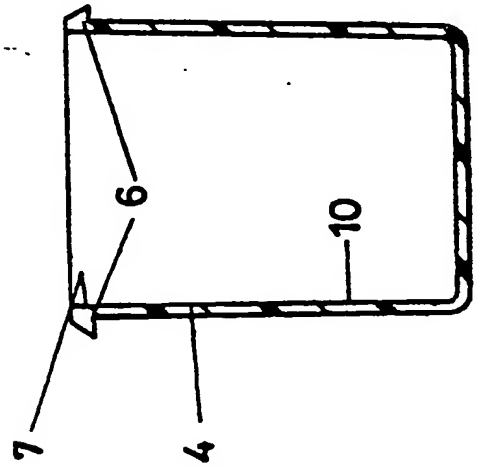

FIG 5

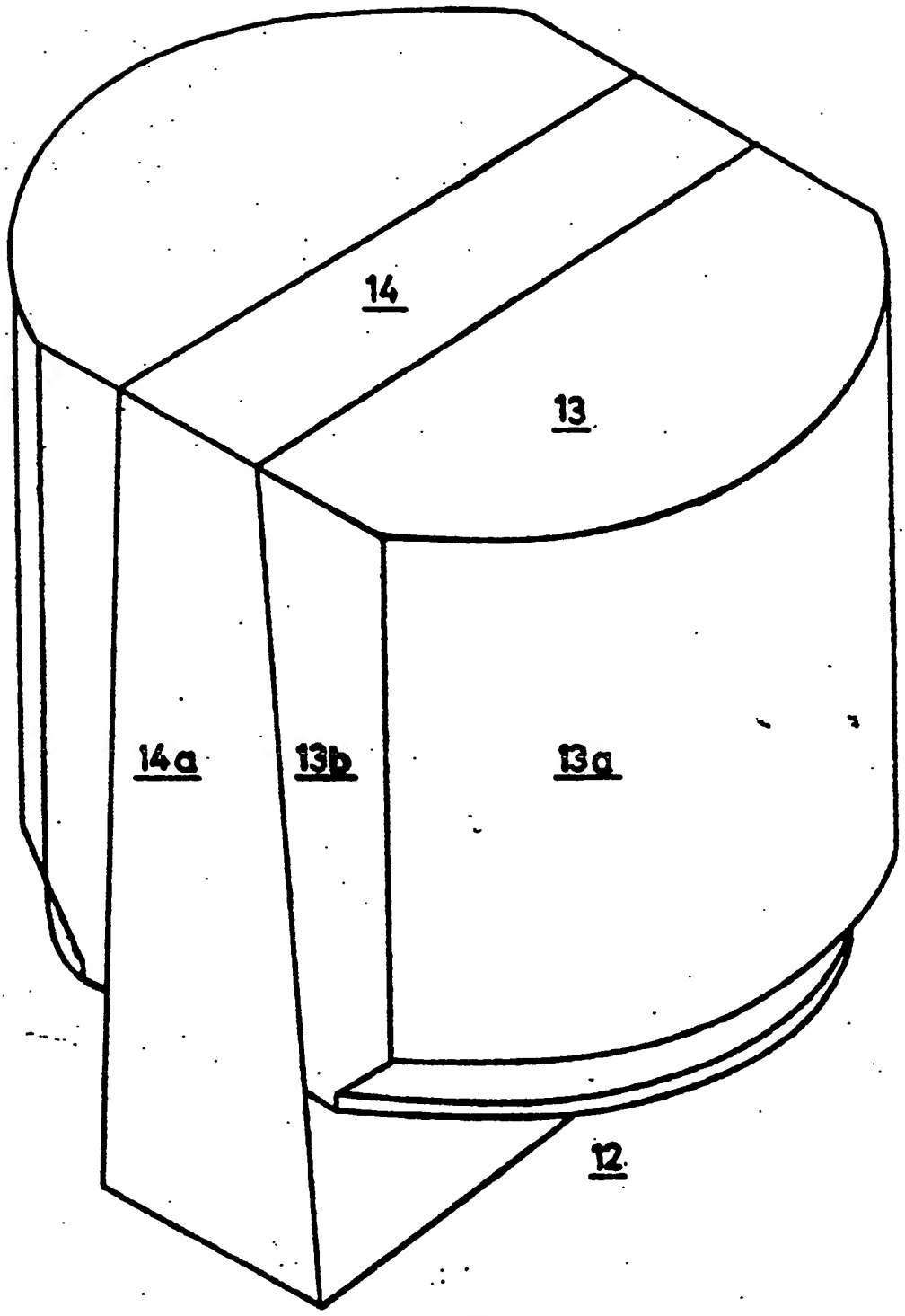

FIG 7

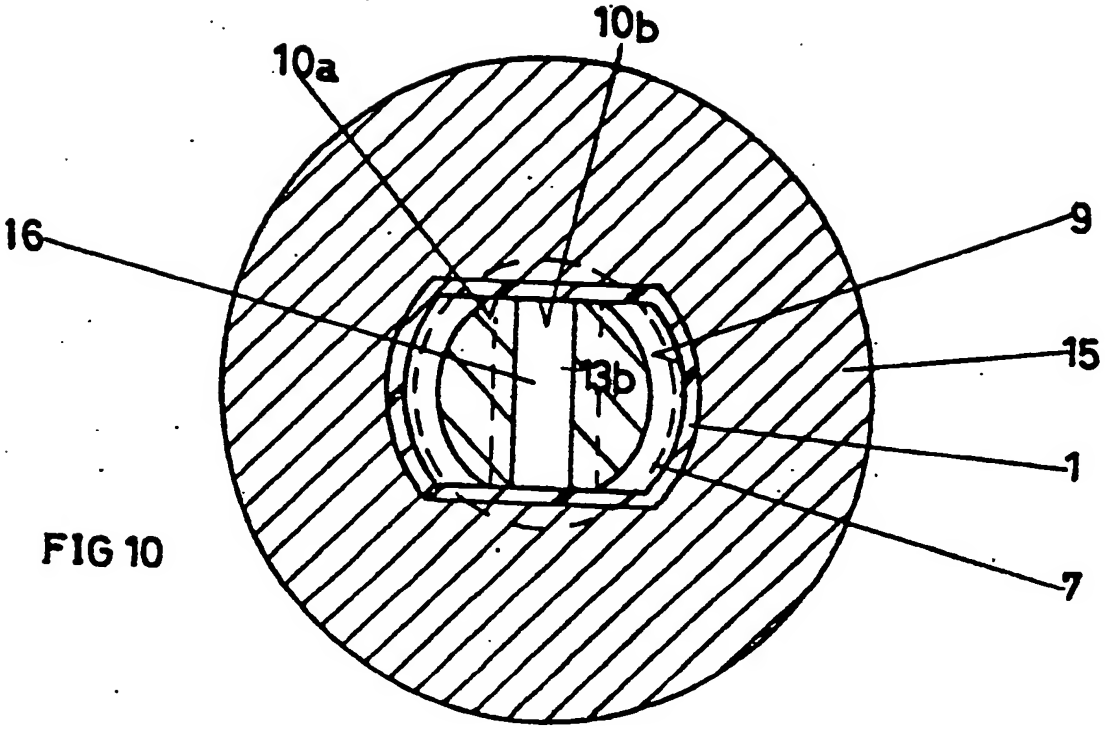

FIG 10

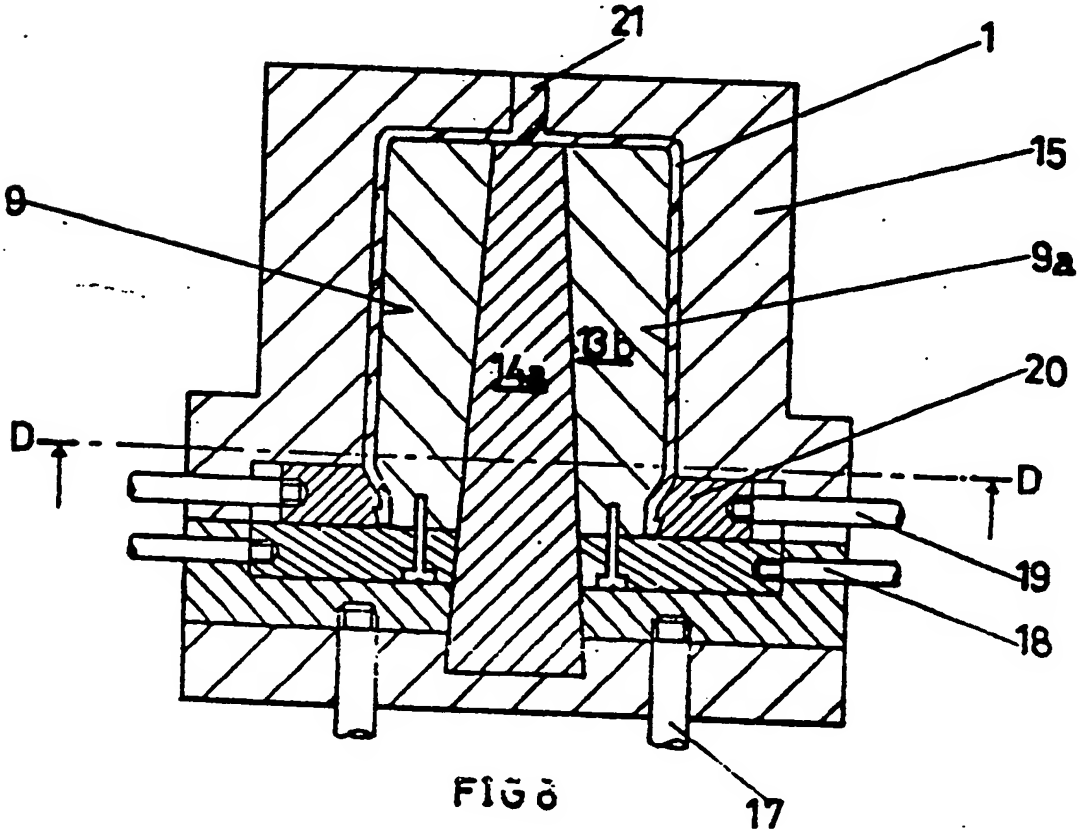

FIG 8

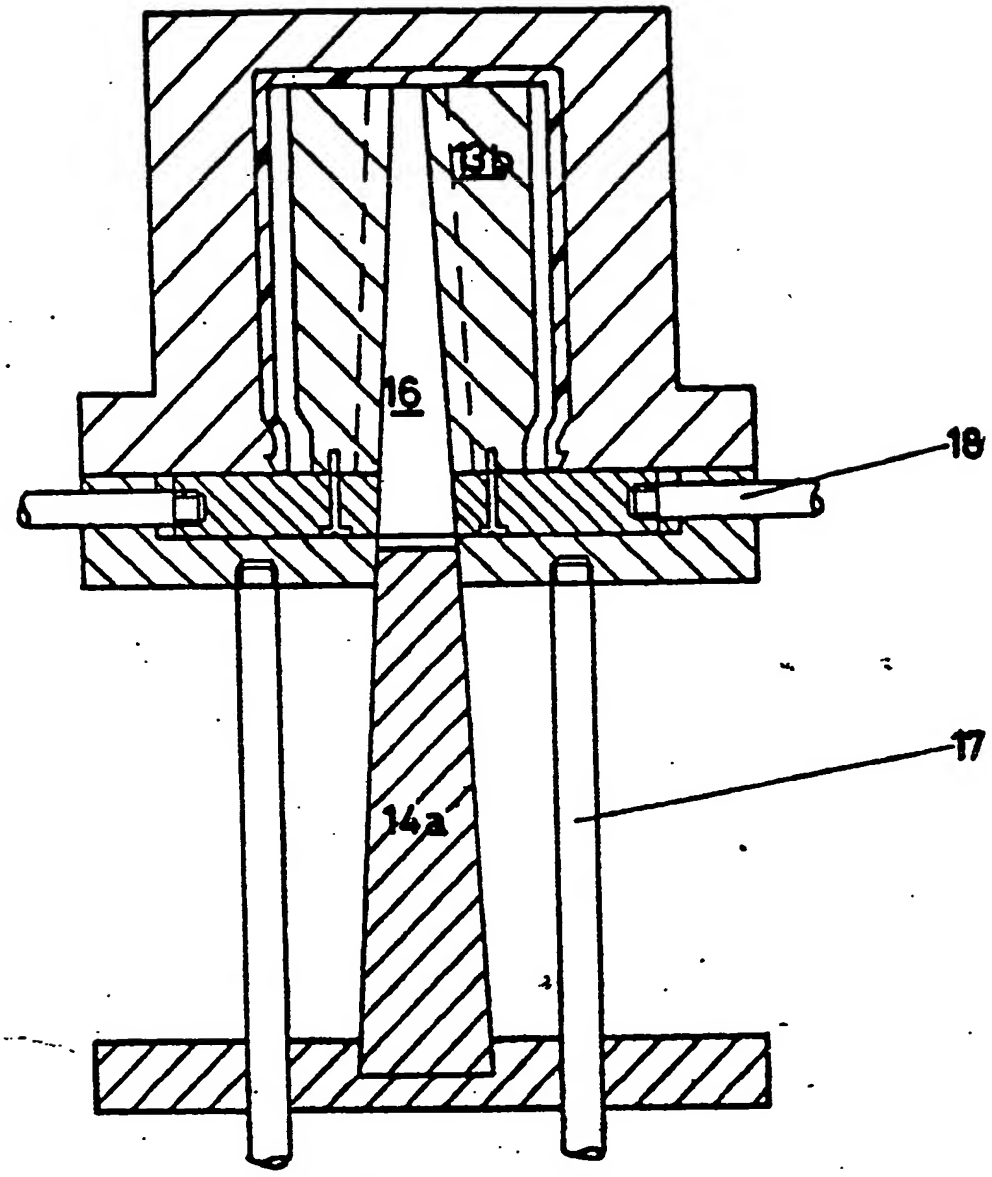

FIG 9

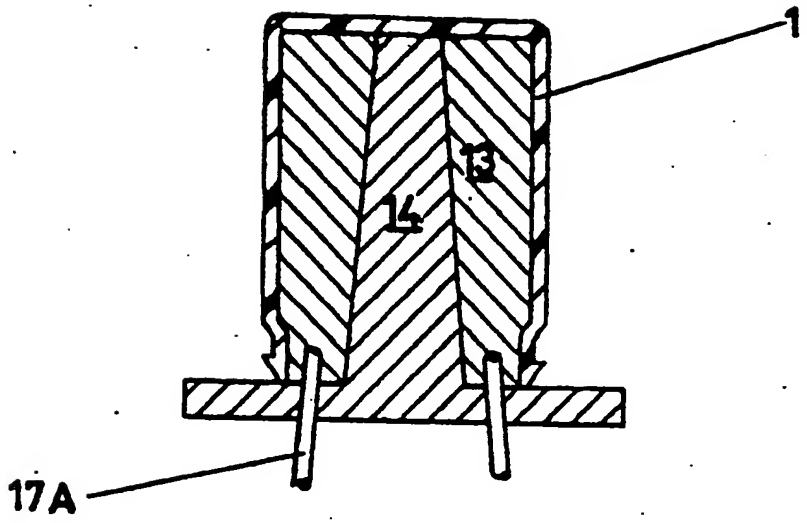

FIG 11

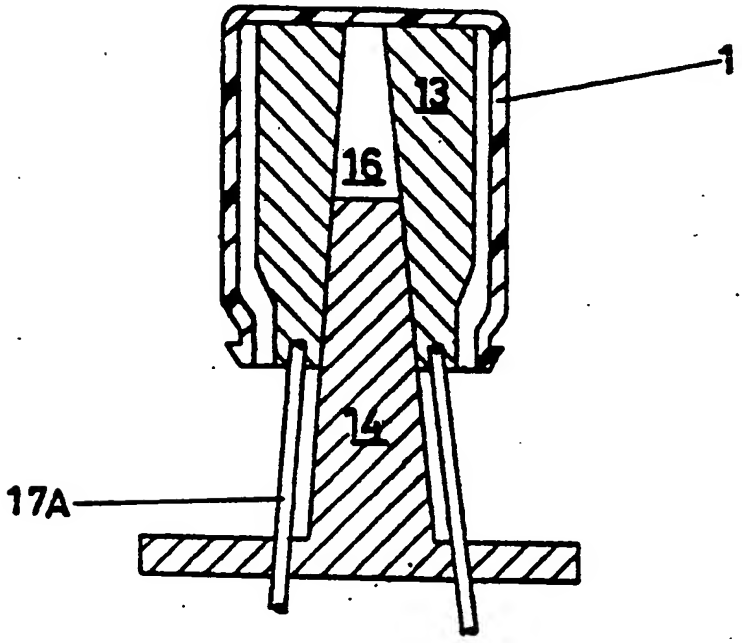

FIG 12

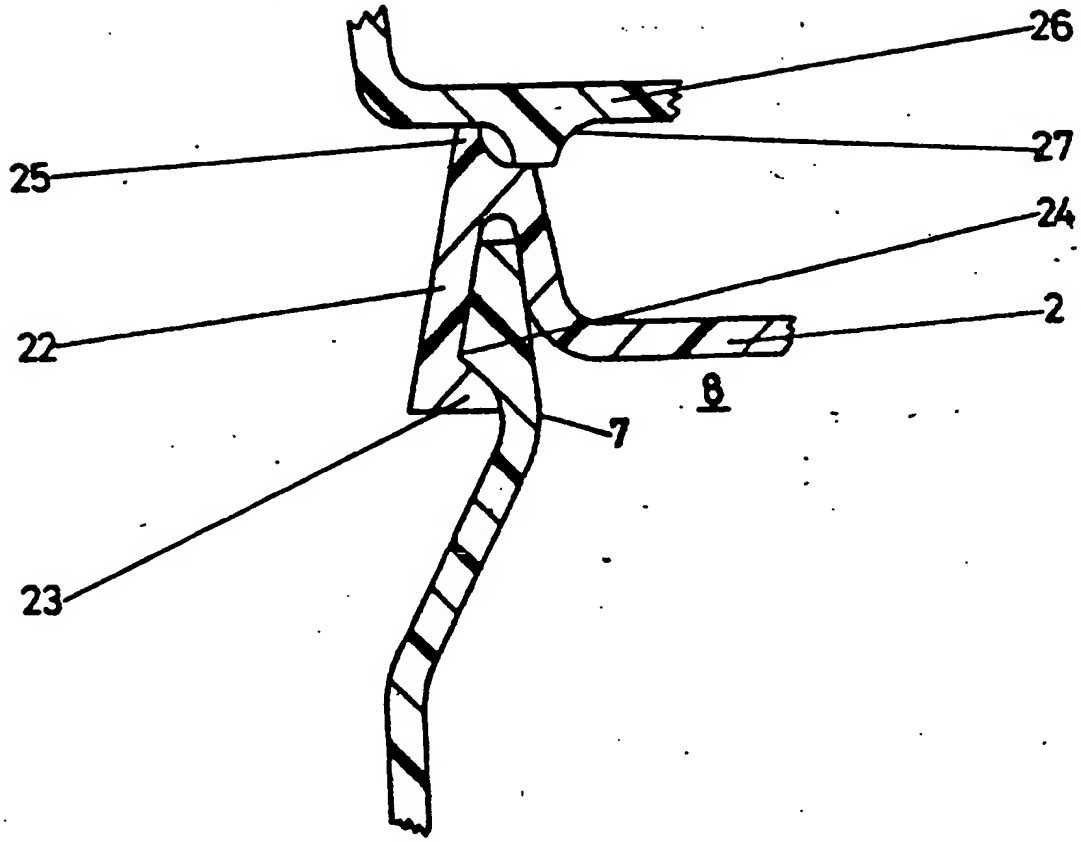

FIG 13

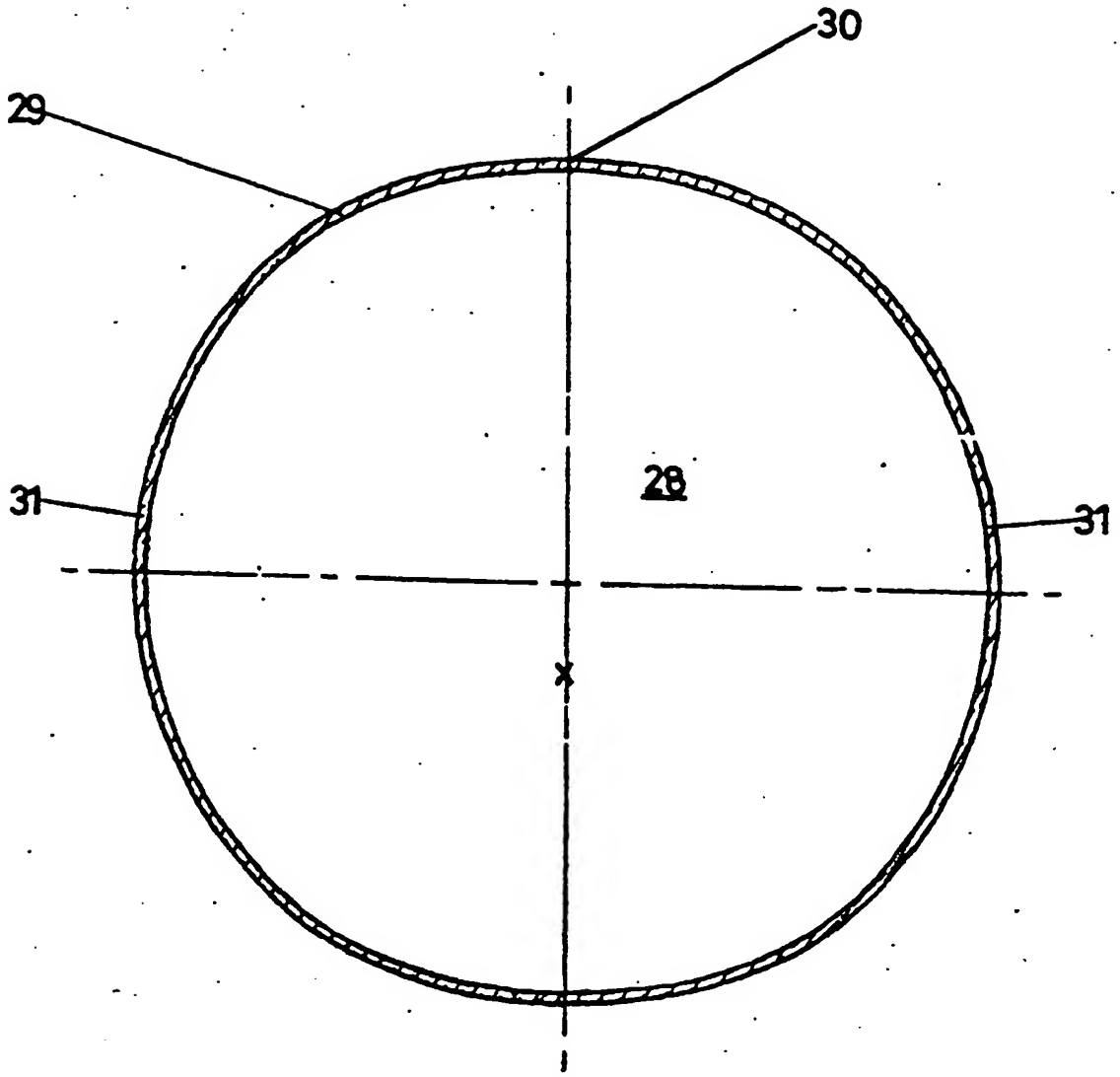

FIG14

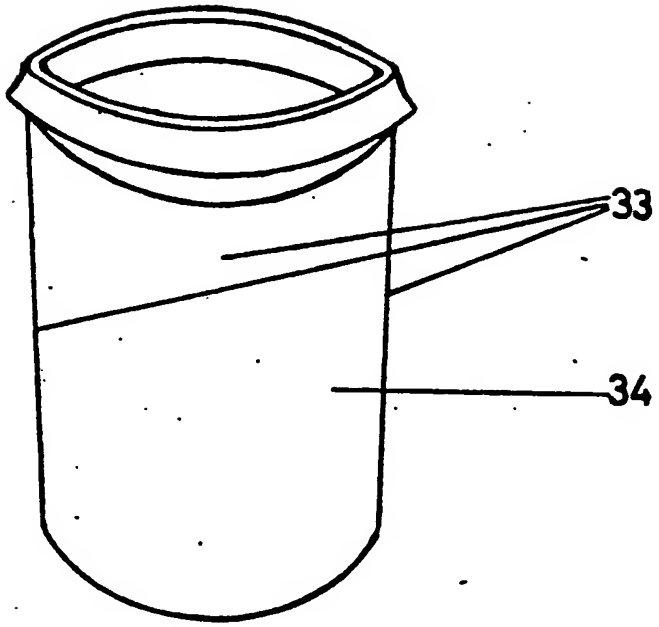

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FIG 15

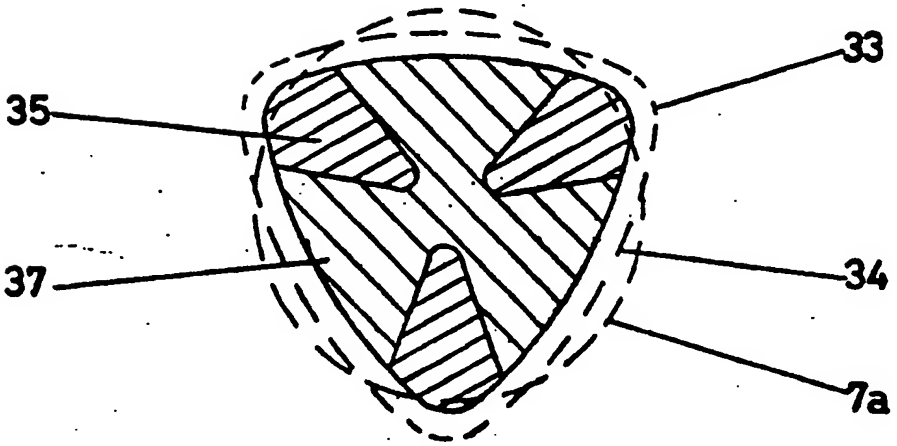

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FIG 16

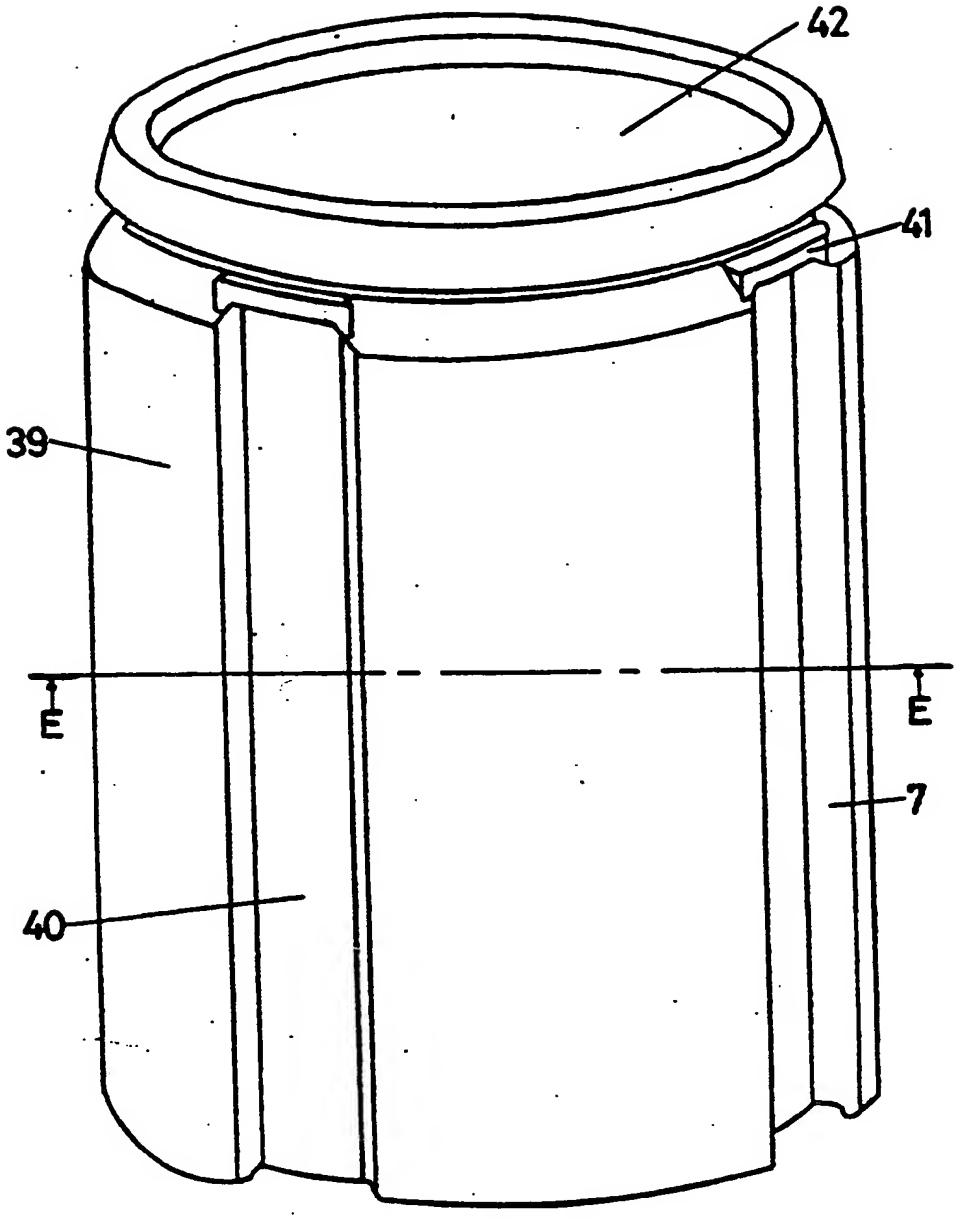

FIG17

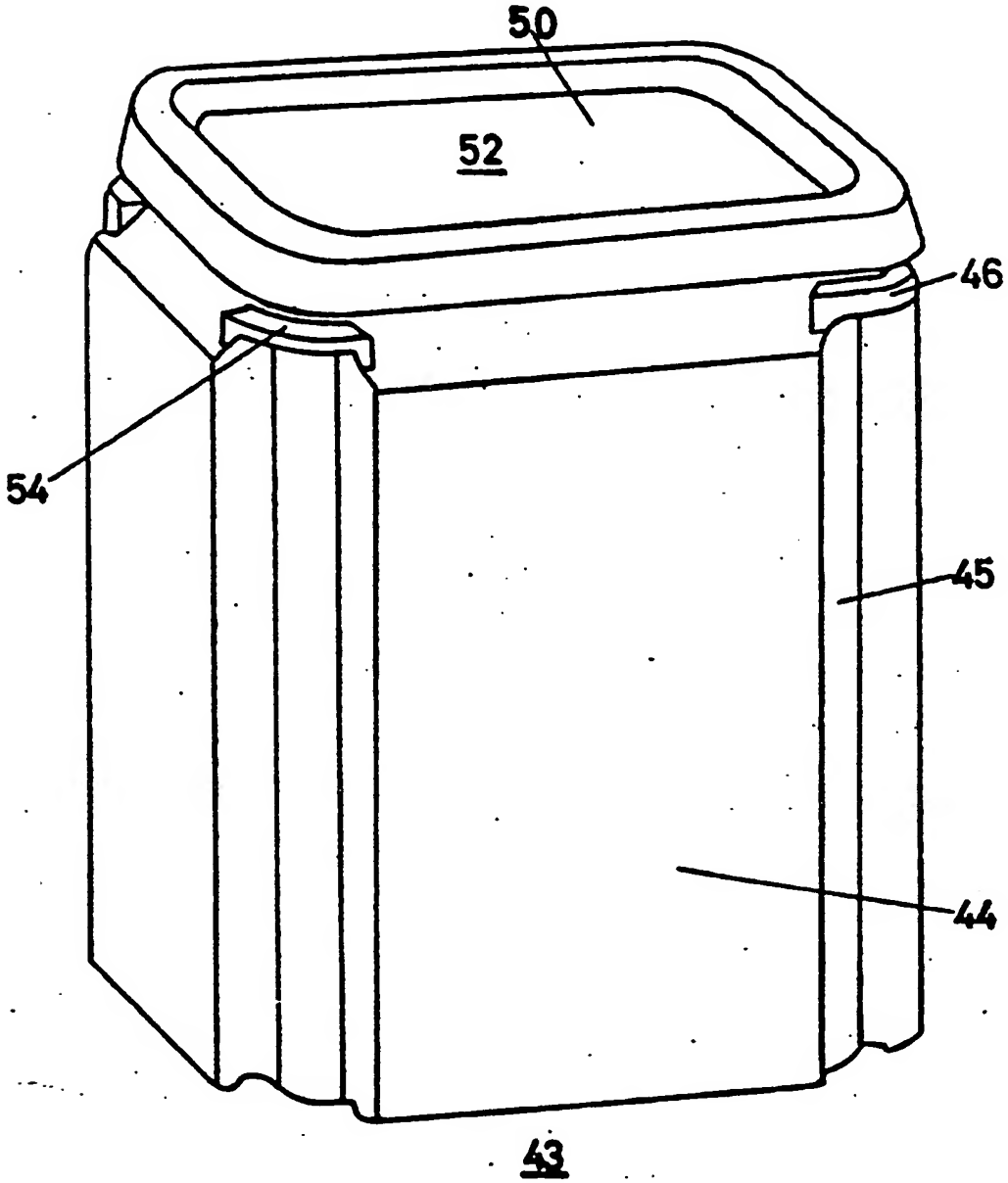

FIG 19

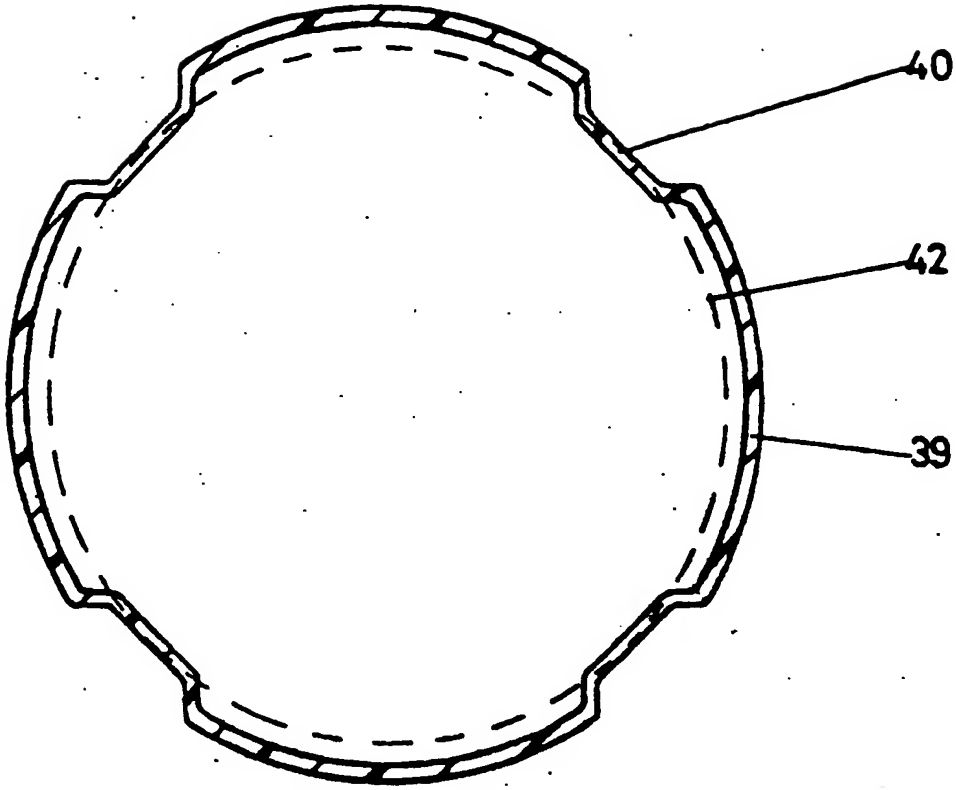

FIG 18

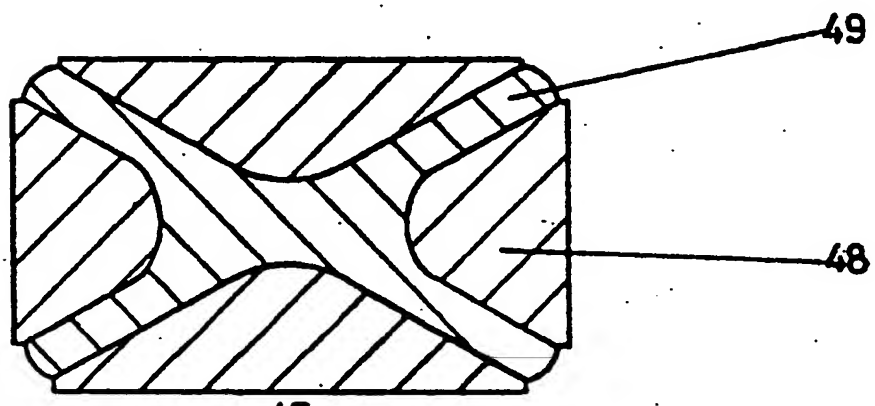

FIG 20

European Patent Office

EUROPEAN SEARCH REPORT

Application number
EP 78 30 0221

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
A	GB - A - 1 207 017 (MAUSER)	1
A	US - A - 3 107 838 (BRYS)	1
A	US - A - 3 133 662 (SKIDLER)	1
A	GB - A - 1 152 096 (DAVIES)	1

CLASSIFICATION OF THE APPLICATION (Int. Cl.²)

B 65 D 1/14
B 65 D 43/10

TECHNICAL FIELDS SEARCHED (Int.Cl.²)

B 65 D 1/00
B 65 D 43/00
B 65 D 21/00
B 29 F 1/00

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	2-11-1978	MARTIN

EPO Form 1503.1 06.78